D-11 MISCELLANEOUS UNITS [6 CCR 1007-3 § 100.41(b)(10); § 264.600 through 264.603]

This section presents information on the Explosive Destruction System (EDS) units that will be operated at the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) EDS site.

Section D-11a is a description of the miscellaneous units. **Section D-11b** describes inspection and closure of the units, as well as waste characterization and treatment. **Section D-11c** provides information on how the miscellaneous units will be monitored, as well as responses to leaks and corrective actions. **Section D-11d** describes how the miscellaneous units will comply with Resource Conservation and Recovery Act (RCRA) organic air emissions regulations. **Section D-11e** addresses the environmental performance standards for miscellaneous units. Information on utilities and facility support equipment for the PCAPP EDS site is presented in **Attachment D-1.**

D-11a Description of Miscellaneous Unit [6 CCR 1007-3 § 100.41(b)(10)(i)]

The two miscellaneous units addressed in this permit modification are the EDS units. These units do not fit the definition of container, tank, surface impoundment, waste pile, land treatment unit, landfill, incinerator, boiler, industrial furnace, or underground injection well. Therefore, these units are defined as miscellaneous units under 6 CCR 1007-3 § 260.10.

The EDS is a transportable system designed to safely access and treat the chemical fill inside an energetic munition, while at the same time destroying the energetic components of the munition. Two configurations of the EDS Phase 2 Unit will be used at Pueblo Chemical Depot (PCD), the EDS Phase 2R (P2R) and EDS Phase 2A (P2A). The Containment Vessels for both units perform the same function and are designed, built, and tested to the same criteria. However, there are differences in components and support equipment. The following sections describe EDS components and equipment; where there are differences between the P2R and P2A units, the information is noted by EDS configuration and subheading.

D-11a(1) Physical Characteristics [6 CCR 1007-3 § 100.41(b)(10)(i)(A) and (B)]

This section provides design information for the miscellaneous units as well as the area in which they will be located. This information includes material of construction data, unit dimensions, unit design, and

construction. **Figures D-11-1**[1] and **D-11-2** present the layout of the major components of the EDS P2R and the P2A.

D-11a(1)(a) EDS

Two EDS Phase 2 units will be operated at the PCAPP EDS site, the EDS P2R and the EDS P2A. Each EDS unit will be capable of safely withstanding a detonation of up to 9 pounds of trinitrotoluene (TNT) equivalent explosives. When items in universal munition storage containers (UMSCs) are processed, both the item and UMSC overpack will be placed in the EDS for treatment. Items in UMSC overpacks will not be unpacked.

Each EDS unit comprises the following components:

- Trailer/Skid Subsystem
- Lift Assist Subsystem (P2R only)
- Containment Vessel Subsystem
- Clamp Hanger Subsystem (P2R only)
- Clamp Closure Subsystem
- Rotary Agitation Subsystem
- Reagent Supply Subsystem
- Utility Container Subsystem
- Waste Transfer Subsystem
- Electrical Subsystem
- Explosive Opening Subsystem
- Gas Supply and Leak Detection Subsystem.

Table D-11-1[2] provides a physical characteristics summary of the EDS P2R and EDS P2A components. In addition to the figures presented in this section, drawings are provided in Section M, Technical Data Package, of this permit modification.

The following sections describe each component and function.

[1] All figures are located at the end of this section.
[2] All tables are located at the end of this section.

D-11a(1)(a)(i) Trailer/Skid Subsystem

EDS P2R

The EDS P2R trailer provides the transportation and work area platform for the EDS unit and has on-board secondary containment for the Reagent Supply Subsystem and the Containment Vessel.

The EDS P2R trailer is a dual-axle, single-drop trailer, with four hydraulic leveling jacks, one between each of the dual wheels, which provide the capability to stabilize and level the trailer during setup. A custom, one-piece tarp and two-piece tarp will cover the top and sides of the trailer when the EDS is transported or stored. The trailer is road legal on all U.S. roads and highways. A prime mover (tow vehicle) equipped with a fifth wheel and standard light and air connections is needed to tow the trailer. The tow vehicle does not require any nonstandard alterations.

The Containment Vessel is mounted in front of the axles of the trailer with the Containment Vessel door facing toward the front of the trailer. The area between these components serves as operations and munitions loading areas. The electrical distribution panels, power conditioners, power panels, utility panel, and process panel are mounted at the front of the trailer on the gooseneck. The process controls and instrumentation displays are readily available from the operations and munitions loading area. The controls and displays for the supply tank heaters, tank level indicators, and hydraulic nut pump controls are located in the front of the operations and munitions loading area. The reagent supply platform is located on the curbside of the trailer. This platform houses the reagent supply panel, water and reagent supply tanks, valves, pumps, and piping. The hydraulic nut pump is controlled from the vessel control panel located on the roadside of the trailer. The processing valves are located on both the reagent supply platform and the Containment Vessel door. Air supply and hydraulic lines run on the underside of the trailer deck.

The working surface of the trailer is about 11 inches below the Containment Vessel mounting surface and is made of stainless steel for compatibility with chemical agents or treatment reagents. The trailer has an open stainless steel grid over a stainless steel secondary containment pan. The area around the secondary containment, gooseneck, and vessel is covered with 1/4-inch stainless steel diamond plate. The secondary containment pan floor is sloped from the gooseneck toward the Containment Vessel and is equipped with spray nozzles to wash down the pan. The rails and the structure below the stainless steel working surface are made of carbon steel.

The trailer is accessed from three fold-down stairs and has additional foldout platforms on each side for access around the vessel and the clamp hanger superstructure. A safety rail surrounds the trailer, including the area where the electrical panels are mounted onto the gooseneck.

EDS P2A

The EDS P2A skid is the base of a flat-rack commercial shipping container with I-beams along the sides and regularly spaced C-channels running between them. Stainless steel diamond plate decking and a secondary containment sump with grating are installed at the working end of the skid. Steel mounting pads for the vessel and motor stands have been installed and are surrounded with carbon steel plate painted with chemical agent resistant epoxy paint filled with a non-slip material on the skid under and behind the vessel. The skid is 12 inches tall. In use, the skid sits on support feet that attach at the corners. With the feet in place, the deck is 16 inches above the ground. There are forklift pockets on the sides and standard cam lock features at the corners to secure it to a chassis or trailer.

The vessel faces toward the front of the skid. The major electrical panels are mounted on the rear end of the skid and are accessed from off the skid.

The assembled skid weighs approximately 29,000 pounds. The center of gravity is about 3.5 feet above the ground, 8 feet from the front of the skid (just aft of the front fork pocket), and roughly centered along the long axis of the skid. The highest feature on the system, which is the drive motor, reaches 94 inches above the deck.

A platform with rails and steps was fabricated to provide easy access and additional working area around the vessel at the front and along one side. There is also a separate, raised platform by the other side of the skid that provides convenient operator access to the clamp closure screw and holds the tool balancer for the large pneumatic clamp closure torque wrench. The fluid skid sits next to the skid in much the same location as the Reagent Supply Subsystem on the P2R.

D-11a(1)(a)(ii) Lift Assist Subsystem (P2R Only)

To aid lifting and positioning heavy objects either onto or off the trailer deck, the EDS P2R trailer is equipped with a Lift Assist that is mounted to the overhead clamp hanger support frame. The Lift Assist is an articulated arm crane (jib crane) with a computer-controlled electric winch that allows vertical lift and positioning from ground level to the EDS Containment Vessel loading area. The Lift Assist

comprises two main components: the winch and the articulated arm jib crane. The winch is a commercially manufactured item. The articulated arm jib crane is a commercially tailored product. The electric winch is removed during transportation. Physical characteristics are presented in **Table D-11-1**.

D-11a(1)(a)(iii) Containment Vessel Subsystem

The EDS Containment Vessel is where the munitions and other items being destroyed are accessed and the chemical fill is treated. The Containment Vessel is designed to contain the explosive blast and fragments created when the explosive is detonated as well as prevent the release of chemical agent liquid and vapors. The vessel serves as the reactor vessel for treating the chemical fill and explosive component residue, providing mixing and heating (when needed) to facilitate treatment. The cylindrical Containment Vessel is made of forged type 316 stainless steel. A hinged door allows easy access for inserting items to be treated and removing debris. The door of the P2R is secured with two large clamp-halves attached to four threaded rods with hydraulic nuts; the door of the P2A is secured using a three-piece clamp and drive screw (see description of the Clamp Closure Subsystem). The Containment Vessel relies on its all-metal seal to contain each detonation and chemical fill. An ethylene propylene diene monomer (EPDM) O-ring, along with the all-metal seal, provides an annular airspace to measure the stability of the annular space vacuum and to test the vessel door seal. Following detonation, treatment reagents are delivered into the Containment Vessel.

Secondary containment for the Containment Vessel is provided by the EDS Trailer/Skid Containment Pan. Dimensions of the P2R and P2A pans are provided in **Table D-11-1**. Containment volume for each EDS Trailer/Skid Containment Pan is more than 100 percent of the respective Containment Vessel volume. The secondary containment calculation for both the EDS Trailer and Skid Containment Pan is provided in **Attachment D-2**.

The Containment Vessel was designed and fabricated to American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section VIII, Division 3 code case 2564 for impulsively loaded vessels. The static working pressure is 2,800 pounds per square inch gauge (psig) with an impulsive load of 9 pounds TNT equivalent explosives.

Temperature monitoring from the thermocouple provides feedback to the temperature controller located on the Containment Vessel control panel. The desired temperature can be set within a range of ±9°F on the Containment Vessel control panel. The nominal operating temperature range of the Containment Vessel is 0°C to 110°C (32°F to 230°F).

The Containment Vessel contains the following components:

- Door assembly with door valves and fittings
- Door hinge and support jack.

Door Assembly

The door assembly provides access to the interior of the Containment Vessel, ports for steam injection as well as for liquid and vapor sample transfer, and feedthrough connections for firing. **Figures D-11-3** and **D-11-4** show the EDS P2R and P2A vessel doors, respectively. Both door assemblies have the following features.

- Metal-to-metal seals for the door and feedthrough flange ensure total containment of solid, liquid, and vapor byproducts.
- An EPDM seal (O-ring) is also on the door and feedthrough flange to allow for leak testing the metal seal.
- The door has stainless steel blast (protector) covers mounted on the interior side to protect connections during detonation operations.
- Manual high pressure valves control flow through the fill and drain ports on the door assembly.
- A thermocouple monitors the internal temperatures during processing operations.
- The medium pressure, high-temperature, packed-stem valves protect the system components from the pressure spike during detonation.
- Manual medium pressure valves control flow of liquids and vapors to and from the Containment Vessel.
- No method of pressure relief (for example, rupture disk or pressure relief valve) is provided due to the risk of venting toxic vapors.

- Manual medium pressure valve assemblies are used to collect liquid and vapor samples.

- Port fittings and primary containment valves use Autoclave Engineers medium pressure hardware for injecting steam.

- Self-closing quick disconnect fittings are provided for liquid and vapor flow.

- High voltage electrical feedthroughs connect the Firing System to the detonators inside the Containment Vessel.

Door Hinge and Support Jack

The door hinge assembly consists of a pin, bushings, features to open and close the door, adjustments for alignment with the Containment Vessel, and a mechanical stop that prevents the door from unintentionally closing when open.

The machine screw jack incorporates an alloy steel worm, which drives a high-tensile bronze worm gear. The worm shaft is supported by antifriction bearings with seals that prevent loss of lubrication. The housing is made of ductile iron that is rated to support the unit load. Fabric-type boot protectors are provided to cover the exposed portion of the lifting screw. The jack provides support for the Containment Vessel door and hinge when the door is open.

Physical characteristics of the Containment Vessel Subsystem are shown in **Table D-11-1**.

D-11a(1)(a)(iv) Clamp Hanger Subsystem (P2R Only)

The EDS P2R contains a Clamp Hanger Subsystem used for opening and closing the Containment Vessel door clamps and supporting their weight while the Containment Vessel door is open. This subsystem consists of two clamp hanger assemblies, one for each clamp half, with proximity sensors, two drive-pin assemblies that each attach to a clamp hanger assembly and a lead screw with an electric drive motor, weight-supporting superstructure, control panel, and pendant control used in lieu of control panel when precise movement is necessary.

D-11a(1)(a)(v) Clamp Closure Subsystem

The main function of the Clamp Closure Subsystem is to provide sufficient pressure to adequately seal the Containment Vessel and door.

The Clamp Closure Subsystem consists of the following components:

- Hydraulic tensioner power unit (P2R only)
- Grayloc® clamps
- Pneumatically-driven nut runner unit (P2R only)
- Pneumatic wrench-driven clamp trunnion screw (P2A only)
- Pressure gauges
- Hydraulic hoses and connections
- Pendant controller.

EDS P2R

The EDS P2R will have two Grayloc clamp halves attached to four threaded steel rods with hydraulic nuts clamped around the Containment Vessel door. The Containment Vessel relies on a Grayloc all-metal seal to contain the detonation and the chemical agent. As the nuts are tensioned, the steel rods apply pressure to the flange, pressing the door into the metal ring and forming a metal-to-metal seal between the door, the metal ring, and the Containment Vessel. The clamps are initially drawn together using a pneumatically-driven nut runner unit to ensure gas-tight Containment Vessel operation.

EDS P2A

The EDS P2A will have a three-piece Grayloc clamp mounted on a support plate that holds the clamp in its proper position with relation to the Containment Vessel and the Containment Vessel door hubs. All that is needed to tighten the three-piece clamp is to turn the one drive screw to its proper torque. The single closure drive screw is supported by a fixed block that maintains the centerline of the clamp while it is opening and closing.

A high speed pneumatic torque wrench turns the drive screw most of the way while a larger, lower speed wrench is used to generate the torque required for final closure. The larger wrench weighs approximately

70 pounds, hangs from a lift-assist fixture attached to a pole on the raised platform, and is swung from the stowed position to the drive screw. The smaller wrench weighs less than 10 pounds and is easy to handle. Therefore, no structural assist feature is needed, although a storage feature is provided on the raised platform to store the wrench when not in use. The torque that each wrench generates is a function of the air pressure provided to the wrench. The air pressure to each wrench is controlled by separate regulators on the fluid skid.

D-11a(1)(a)(vi) Rotary Agitation Subsystem

The Rotary Agitation Subsystem rotates the Containment Vessel 360 degrees and then reverses the direction for the same amount of time and revolutions, unless halted. The absolute encoder tracks Containment Vessel movement so that if halted in mid-cycle, the rotation is restarted in the direction and for the number of rotations required to complete the cycle.

The Rotary Agitation Subsystem includes the following components:

- Drive motor and mount assembly
- Vessel support assembly
- Hub/shaft assembly
- Absolute encoder
- Incremental encoder
- Fan motor.

Drive Motor and Mount Assembly

An electric motor and gearbox are mounted on the motor support structure. The gearbox output shaft provides a mechanical coupling with hub/shaft assembly. The Drive Motor and Mount Assembly includes the motor support structure, motor and gearbox to vessel hub coupler, and bearing assembly.

Vessel Support Assembly

The support structure near the front of the Containment Vessel holds the two casters that support the Containment Vessel as it rotates. The support structure at the rear of the Containment Vessel is a

two-piece safety ring and mount assembly used during transport or if performing maintenance that requires the rotation shaft assembly to be disconnected from the Containment Vessel.

Hub/Shaft Assembly

The Hub/Shaft Assembly is located between the Containment Vessel and the drive motor gearbox output shaft. The drive motor turns the Containment Vessel through the Hub/Shaft Assembly. A slip ring, a coupler, and a bearing are installed on the hub/shaft. The coupler attaches the hub/shaft to the gearbox of the motor and takes up any misalignment between the two assemblies. The bearing holds the rotating shaft and attaches to the mount assembly.

Absolute Encoder

The Absolute Encoder is mounted on the aft (rear) shaft of the drive motor gearbox. The data from the encoder is used by the drive system to stop the Containment Vessel at the "home," "fill," and "drain" positions, in addition to rotating the Containment Vessel. Additionally, the encoder tracks the Containment Vessel position, ensuring an equal number of revolutions in the clockwise and counterclockwise directions.

Incremental Encoder

The Incremental Encoder located inside the electric drive motor controls the number of Containment Vessel revolutions.

Fan Motor

A fan motor is mounted on the top of the electric motor to prevent overheating of the drive motor.

D-11a(1)(a)(vii) Reagent Supply Subsystem

The Reagent Supply Subsystem is used to hold, heat, and transfer reagent and water used to treat the chemical fill and water to rinse the Containment Vessel. Physical characteristics of the Reagent Supply Subsystem are shown in **Table D-11-1**.

EDS P2R

The reagent supply platform is located on the curbside of the trailer. The platform contains hydraulic cylinders, a secondary containment pan, supply tanks, pumps, valves, and tubing for the Reagent Supply Subsystem. The hydraulic cylinders fold the platform onto the trailer deck for shipping and extend the platform for operations. The platform is slightly higher than the working deck of the trailer in the extended position. The adjustable folding legs support the platform. All the pumps are located on a pump rack, near the back edge of the platform.

The Reagent Supply Subsystem supplies the two stainless steel tanks located on the reagent supply platform with appropriate reagent, solvent, or water, pending transfer to the Containment Vessel for chemical neutralization. Tank 1 is intended for water and Tank 2 is intended for reagents.

The tanks are equipped with external heaters for freeze protection and to make viscous fluids easier to pump. Two pneumatic double diaphragm source pumps transfer water and reagents through lines and manually controlled valves to the tanks. Two high-pressure supply pumps transfer water and reagents through lines and valves to the Containment Vessel. A valve panel allows for the sampling and removal of waste fluids from the Containment Vessel. Valves are located on the platform, the Containment Vessel door valve panel, and the secondary containment pan.

The Reagent Supply Subsystem includes the following components:

- Reagent supply panel
- Hose docking station
- Water and reagent tanks
- Pan pump panel
- Pan pump
- Vacuum pump
- Water and reagent supply pumps
- Reagent source pump
- Water source pump
- Gas panel
- Waste container quick-disconnect bracket.

Reagent Supply Panel

This panel provides the operator with access to the mounted valves to control the reagent supply system. Cutout windows allow visual access to the magnetic float level indicators on the supply tanks.

Hose Docking Station

The station located to the right of the reagent supply panel holds the QE (effluent drain hose), QS (reagent, helium, and water supply hose), QV (vacuum hose), and LD (vacuum flange on helium leak detector hose) during Containment Vessel rotation. The Hose Docking Station also holds the hydraulic tensioner pump hose during vessel rotation. Proximity switches initiate Containment Vessel rotation only when the hoses are in their docking station.

Water and Reagent Tanks

The rinsewater tank has a cooling jacket and the reagent tank has external electrical heaters to supply the fluids at prescribed process temperatures. Tanks have thermocouples for temperature control and side-mounted float level indicators with high- and low-level switches. The low-level switch, when activated, will shut off the external tank heaters and sound an audible alarm.

Pan Pump Panel

A panel located on the rear of the reagent supply platform on the pump rack contains a quick-connect and three hose storage connections. Three storage quick-connects cap the hose lines to the trailer secondary containment pan, reagent supply platform secondary containment pan, and the strainer during non-operational periods. The functional quick-connect leads through a valve to a pneumatic pan pump and then to the pan waste container.

Pan Pump

A pneumatic double diaphragm pump is used for removing wastes from the secondary containment pan.

Vacuum Pump

The vacuum pump evacuates sample lines prior to collecting a liquid or vapor sample. The vacuum pump exhaust is routed through a waste drain manifold and vented through an exhaust manifold at the top of the interim holding container to the Environmental Enclosure Air Filtration System (AFS).

Water and Reagent Supply Pumps

Two high-pressure supply pumps are used to supply water and reagent to the Containment Vessel from the tanks. Pneumatic motors drive the pumps with the pneumatic motor input set to 80 psig for normal operations. The pneumatic motor input pressure can be increased to a maximum of 100 psig to overcome higher than normal Containment Vessel pressures.

Reagent Source Pump

An electric drum is used for filling the reagent tank.

Water Source Pump

The pneumatic double diaphragm pump is used to fill the water tank from a water source and can supply pressurized water to the nozzles in the trailer secondary containment pan.

Gas Panel

A panel located on the side of the reagent supply platform next to the curb side stairs contains air pressure regulators and a helium regulator. The gas panel supplies compressed air for the pneumatic pumps and wrenches, low pressure helium for leak checking, and nitrogen for post-process vessel purging. Helium is supplied by a gas bottle restrained to the trailer. Compressed air and nitrogen are supplied from a compressor and gas cylinders outside the Environmental Enclosure. The air regulators control the maximum air pressure to the source pumps and the supply pumps. The helium regulator limits the maximum helium pressure for leak rate testing to approximately 20 pounds per square inch (psi). The two valves provide an auxiliary air connection for pneumatic tools, etc. The four quick-connects provide water or reagent to the spray nozzles in the trailer secondary containment pan, pneumatic inlet to the reagent supply platform, and helium inlet to the reagent supply platform.

Waste Container Quick-Connect Bracket

The bracket on the aft side of the reagent supply platform provides the hose quick-connects to a waste container. The bracket also contains an effluent sample collection station.

D-11a(1)(a)(viii) Utility Container Subsystem

The Utility Container Subsystem generates steam that is used to significantly reduce the time it takes to heat the Containment Vessel for both the neutralization step and the subsequent hot water rinse. Each EDS unit has an associated Utility Container Subsystem that consists of a steam generator, a water softener cartridge, an oxygen scavenger pump, a blow down tank, a flow meter, and controls mounted on a small skid. Saturated steam at approximately 180°C ±10°C (approximately 150 psi) is supplied to the fluid skid and from there to the vessel by a 60 kilowatt (kW) steam generator. Power is supplied to the steam skid from the EDS electrical distribution panel. Controls and instrument readouts for the steam skid are located on the fluid skid.

The control system is designed to heat the fluid in the Containment Vessel to a specified setpoint and then hold the fluid at that temperature until the control system is shut off. Control is established by opening and closing a solenoid to regulate the flow of steam. A small bypass around the steam control valve with a check valve ensures that there is always a small positive flow to prevent backflow into the steam hoses. There is an additional check valve in the steam line on the vessel door for the same purpose. An interlock prevents the steam solenoid valve from opening if the steam supply pressure is less than the vessel pressure.

D-11a(1)(a)(ix) Waste Transfer Subsystem

The Waste Transfer Subsystem equipment is used to:

- Drain liquid and vent vapors from the Containment Vessel.
- Drain/pump out liquid from the trailer secondary containment pan and the reagent supply platform secondary containment pan for further transfer to applicable liquid waste containers.
- Contain liquid wastes.

The liquid and vapor will be drained and vented from the Containment Vessel to a United Nations (UN) rated liquid waste container. The container assemblies use weight scales to monitor container weight as a means to account for all effluents and prevent overfilling.

Up to three waste containers will be used. The Containment Vessel waste transfer and secondary containment pan waste transfer diagrams (**Figures D-11-5** and **D-11-6**) depict a typical waste transfer setup using the Intermediate Tank and two liquid waste containers in the drain line from the Containment Vessel. The liquid and vapor generated from chemical treatment and rinsing will be transferred from the Containment Vessel through a hose connected to waste containers 1 and 2 (**Figure D-11-5**) or the Intermediate Tank. The vapor vents out of the liquid waste containers into a vent line that exhausts to the AFS carbon filter system. Open-head containers will be used to contain solid waste materials.

The Tank Skid Subsystem is part of the Waste Transfer Subsystem and consists of the Intermediate Tank, and the Tank Skid Secondary Containment. The Intermediate Tank is a 125-gallon, stainless steel tank that is used to collect and cool hot rinsewater waste from the EDS vessel prior to being pumped to the waste container. The Tank Skid Secondary Containment is constructed of stainless steel and has a containment capacity of 136 gallons.

The liquid waste containers will be placed within portable secondary containment pan(s). **Figure D-11-7** shows an example of a secondary containment pallet that would be used for waste totes (if totes are used).

D-11a(1)(a)(x) Electrical Subsystem

The Electrical Subsystem provides the required 480-volt (V), 3-phase electrical power for the vessel, supply tank heaters, rotary agitation, and drive motor via two distribution panels. Conditioned 120 V power from two distribution panels is supplied to other subsystems. Electrical power can be supplied by utility power (130-ampere minimum) or by a generator (750 kW, 750 V generator). Electrical enclosures in the process area meet the National Electrical Manufacturer's Association (NEMA) 4X requirements for outdoor and corrosive use; all others are specified as NEMA 4 for outdoor use.

D-11a(1)(a)(xi) Explosive Opening Subsystem

The Explosive Opening Subsystem consists of the Advanced Fragment Suppression System (AFSS) munition holder, plus the Firing System and donor charges.

The AFSS and munition holder serves to connect, hold, and align explosive charges that open the main body of items being treated to expose chemical fill and to protect the Containment Vessel interior from the high velocity fragments that result during detonation of shaped charges, burster casings, and munitions (or other items). The following text describes the AFSS framework.

AFSS

The AFSS is a reusable framework with expendable steel rods designed to contain expendable munition holders such as the UMSC holder (**Figures D-11-8** and **D-11-9**) with munitions or other items within. The AFSS consists of the main unit weldment, insert weldment, front capture plate, front spacer, 86 short rods, paddle gap cover (EDS P2R only), and two support plates. **Figure D-11-10** shows the AFSS and associated components. **Table D-11-2** summarizes the physical characteristics of the AFSS.

Donor (Explosive) Charges

Donor charges are used to access the munitions' and other items' fill, thereby releasing the chemical fill into the Containment Vessel. The donor charges are also used in destroying the munition burster explosive (if present). Donor charges consist of linear-shaped charges (LSCs). The LSCs are used in the AFSS munition holder to access the main body of the munition or item to expose the contents for chemical treatment and to disrupt the explosive train of the munitions. The primary requirement, cutting the walls of the munition(s) or item(s), is accomplished with pre-formed length(s) of copper-sheathed LSC with a cyclonite (RDX)-based explosive filler. The shape, length, and grains per foot of the LSC are specific for the type of munition(s) or item(s) to be treated. When processing multiple munitions, up to six LSCs may be used.

Detonators

Exploding bridge-wire detonators are used to initiate donor charges. The Firing System is used to electrically initiate the donor charges. The detonators used to initiate the LSCs are Reynolds type RP-1®. The detonator is insensitive to unexpected or undesirable energy inputs (static, impact, etc.) and is detonated by the discharge of high current through the bridge-wire. The bridge-wire explodes and produces a shock wave, which, in turn, initiates the explosive in the shaped charges. The Firing System is used to simultaneously initiate the LSCs.

Firing System

The Firing System is a high-voltage capacitor discharge unit capable of firing up to six exploding bridge-wire detonators. The Firing System is connected to the detonators in the Containment Vessel by detonator cables, and is remotely operated through a detachable control module that allows the operator to arm and fire the Firing System from up to 350 feet away from the EDS. The firing system includes various features necessary to safely fire the detonators and to test and monitor the system and detonator cables. One of these features is a safety interlock plug to prevent inadvertent operation of the system.

D-11a(1)(a)(xii) Gas Supply and Leak Detection Subsystem

The functions of the Gas Supply and Leak Detection Subsystem are as follows:

- Pressurizes the Containment Vessel to measure the annular space decay rates and test the integrity of the Grayloc seal and the EPDM O-ring of the Containment Vessel and high voltage feedthrough flange

- Measures the annular space vacuum between the Grayloc seal and O-ring mounted on the Containment Vessel door and the high voltage feedthrough flange

- Measures the gas migrating across the Grayloc seals into the annular spaces of the Containment Vessel door and the high voltage feedthrough flange

- Flushes vapors from the Containment Vessel and Containment Vessel door piping and fittings.

The Gas Supply and Leak Detection Subsystem consist of the following main components:

- Compressed gas cylinder
- Pressure regulators and gauges
- Flexible and rigid hoses
- Leak detector.

There are two major components to the Gas Supply and Leak Detection Subsystem: the gas supply component and the leak detector. The gas supply components will provide an inert gas for pressurizing the vessel for the annular space and leak tests and for flushing the Containment Vessel headspace (helium or nitrogen may be used for headspace flushing). The inert compressed gas cylinders are approved Department of Transportation (DOT) steel cylinders. The inert gas cylinders are located on the side of the right side set of stairs and secured by the bottle bracket.

Gas Supply and Leak Detection Subsystems will be used together to test the Containment Vessel and high voltage feedthrough flange annular spaces and seals. The leak detector is mounted in the helium leak detector box on the trailer.

D-11a(2) Operations and Maintenance [6 CCR 1007-3 § 100.41(b)(10)(i)(B)]

Each EDS unit is a transportable system mounted on a trailer or skid and designed to destroy chemical-filled munitions/items with or without explosive components. Explosive linear shaped charges are used to detonate the munition's burster, if present, and breach the munition or item wall to expose the chemical fill. Once the fill is exposed, chemical reagents are added, and the Containment Vessel is rotated and heated. When treatment of the chemical fill is complete, waste materials are removed from the Containment Vessel, placed in waste containers, and temporarily stored pending transport offsite to a permitted treatment, storage, and disposal facility (TSDF).

All operations and maintenance activities will be in accordance with EDS Standing Operating Procedures (SOPs), current version, and the EDS Phase 2 Series Operations and Maintenance Manual, current version, respectively. The complete list of procedures will be maintained in the current version of the SOPs, which will be maintained onsite during operations.

D-11a(2)(a) Pre-Operations

Preventive maintenance checks and services (PMCS) will be performed to keep the EDS units in operating condition. Each EDS unit is prepared for operations and processing by first performing initial setup and pre-operations.

Prior to operating the EDS P2R unit, Supply Tank 1 will be filled with water and Supply Tank 2 will be filled with reagents. Pre-mixed reagents will be pumped via a drum pump from drums or bulk containers

into the Supply Tank. The vessel sealing surfaces are cleaned and lubricated. The steam generator and chiller unit are started up.

The munitions or items to be processed will be transferred from the CSU to an EDS Environmental Enclsoure just prior to treatment.

D-11a(2)(b) Operations

The EDS units will be operated in accordance with EDS SOPs, current versions. Any number of items may be processed at a time in an EDS unit provided the net explosive weight (NEW) capacity is not exceeded. Whether processing one or more items, the treatment operation is the same.

The operational scenario for the EDS consists of the following:

- Loading the item(s) to be processed
- Access fill and destroy energetic components, if present, by detonation
- Treat chemical fill and explosive components and residue; rinse metal parts, fragments, and system
- Transfer waste.

Loading

The items to be processed are placed into an expendable holder that can contain any combination of one or more munitions or items provided the NEW for the EDS unit is not exceeded; then the holder is placed inside an AFSS. The AFSS will already be inside the Containment Vessel.

The shaped charges are placed onto the expendable holder. Detonators are attached to the shaped charges. Once the expendable holder, including items to be processed and donor charges, has been completely assembled, it will be placed into the Containment Vessel. Final detonator connections will be made using the interior detonator jack assembly. The Containment Vessel door and the door clamps will be closed. The clamp rods (screw) then will be tightened.

Accessing Fill and Energetic Detonation of Munitions

Each EDS unit has two separate firing systems: a primary and a backup (firesets A and B). The appropriate firing system will be used to remotely and simultaneously initiate the shaped charges.

When ready, the firing sequence is initiated and the item is detonated.

Treatment of Chemical Fill, Explosive Residue, and Metal Parts and Fragments

The chemical fill will be treated, along with metal parts and fragments, in the Containment Vessel according to the SOP.

For treatment of detonated chemical-filled munitions and other items, the Containment Vessel will be heated using steam to a specified temperature (up to 60°C ±10°C [140°F ±18°F]), and rotated after the appropriate reagent has been added via the spray nozzle. Liquid samples will be collected and analyzed to confirm a treatment level specified in **Table D-1** has been met. Once a treatment level is confirmed, the liquid wastes (neutralent) from the Containment Vessel will be drained into a waste container for storage at the less than 90-day hazardous waste storage area.

The Containment Vessel will then be rinsed with steam and rotated. The hot rinsate is then drained into the interim holding tank and cooled before transfer to a waste container for storage. Any additional rinses will be performed using water. The Containment Vessel will then be purged with an inert gas and a headspace sample collected to verify that the chemical agent vapor concentration in the Containment Vessel is at acceptable levels to open the door. The vessel door will then be opened. The solid wastes will be visually inspected, removed from the Containment Vessel, placed into a waste container, and sealed. Should any unexploded explosive components be found, they will be segregated from the other solid wastes, placed in a separate container, and managed by explosive ordnance disposal (EOD) personnel. An additional manual water rinse will be performed to remove any remaining solid debris inside the Containment Vessel. This rinsate will be collected in the debris pan and transferred to a liquid waste container. All wastes will be stored and managed as hazardous waste.

Before subsequent processing activities commence, the inside of the Containment Vessel will be cleaned and visually inspected. The Grayloc seal, EPDM O-ring seal, and any damaged or bent rods from an AFSS will be replaced after each operation. The electrical connection feedthroughs will be replaced as necessary.

If the EDS undergoes closeout for stand-by mode or is moved to another location within PCD or elsewhere, the EDS will be decontaminated and monitored to appropriate levels. All EDS supplies and components will be removed from the operations area.

Waste Transfer

Liquid and gaseous waste effluents from the Containment Vessel will be drained through flexible hoses connected to waste containers 1 and 2. Emissions from waste containers 1 and 2 will be diverted to the AFS carbon filter system.

Wastes generated from EDS operations will include the following:

- Neutralent and rinsewater
- Decontaminated metal parts, fragments, and UMSC debris
- Used decontamination solution/rinsate
- Secondary containment pan/sump liquids
- Spent prefilters and high efficiency particulate air (HEPA) filters from the Environmental Enclosure air filtration system
- Spent carbon from the Environmental Enclosure AFS
- Used personal protective equipment (PPE)
- Miscellaneous solid and liquid wastes as a result of support, maintenance, and cleanup activities
- Grayloc seal and O-rings
- Unexploded or untreated energetics or propellant material (unlikely to occur but could be generated)

- Potentially agent-containmated empty metal overpacks

- Potentially agent-containmated dunnage/packing material.

Section C of this permit modification contains detailed descriptions of the wastes generated from the EDS operations and support activities as well as information on how wastes will be characterized.

All hazardous waste generated will be placed in appropriate containers and managed in a 90-day hazardous waste storage area at the PCAPP EDS site, pending shipment offsite to a permitted TSDF.

D-11a(3) Mitigative Design and Operating Standards [6 CCR 1007-3 § 100.41(b)(10)(i)(B)]

The EDS units addressed in this permit modification are designed and will be operated in a manner that reduces the risk of environmental contamination. The materials of construction for the EDS equipment are compatible with the chemical agent to be treated, treatment reagent used, and decontamination solutions. Each EDS unit will be on a trailer or skid equipped with secondary containment and located within an Environmental Enclosure consisting of a ceiling, sides, and impermeable flooring (see **Figure D-11-11**). The ground surrounding the Environmental Enclosures for the EDS units will be graded to direct the flow of liquids away from the structure. These design features will protect the EDS units from precipitation run-on and minimize the potential for contaminated runoff. See **Attachment D-1** for a description of the enclosures.

Work areas will be monitored for chemical agent vapors according to the Site Monitoring Plan (see **Attachment F-2**). Workspace air will be vented to an Environmental Enclosure AFS that will contain a sulfur-impregnated carbon filtration system. Fire safety equipment designed for chemical and electrical fires will be staged in the support areas and other firefighting support will be provided by the PCD Fire Department, as necessary.

D-11a(4) Operating Standards

When operating an EDS unit, operations personnel will follow approved procedures designed to reduce the risk of chemical exposure to human health or the environment. These operating procedures will ensure the following:

- Operators are trained in the function and operations of the EDS and associated equipment.
- EDS treatment/destruction operations will be conducted remotely; no personnel will be present inside the Environmental Enclosure during detonations.
- Operations will be observed and recorded through the use of closed-circuit televisions.
- Personnel operating the EDS equipment will wear appropriate PPE.
- Routine inspections of the EDS processing areas and equipment will be conducted.
- Preventive maintenance will be performed at regular intervals.

D-11b Inspection, Closure, Waste Characterization

D-11b(1) Inspection [6 CCR 1007-3 § 100.41(b)(10)(i)(B) and § 264.602]

Inspection schedule and requirements for the EDS units are provided in Section F-2, Inspection Schedule. Example inspection log sheets for the units are provided in **Attachment F-1**.

D-11b(2) Closure [6 CCR 1007-3 § 100.41(b)(10)(i)(B)]

Closure of the EDS units is described in Section I, Closure Plan, of this permit modification.

D-11b(3) Waste Characterization [6 CCR 1007-3 § 264.601(a)(1), 264.601(b)(1), and 264.601(c)(1)]

Characterization information on the munitions and other items that will be processed by the EDS units is provided in Section C-1 of this permit modification.

D-11b(4) Treatment Effectiveness [6 CCR 1007-3 § 100.41(b)(10)(iv)]

Treatment effectiveness for the EDS units is discussed in Section C-1g of this permit modification.

D-11c Monitoring, Analysis, Inspection, Response, and Corrective Action [6 CCR 1007-3 § 100.41(b)(10)(i)(B) and § 264.602]

Monitoring will be conducted at the PCAPP EDS site for worker safety and environmental protection. The monitoring systems will consist of MINICAMS® and Depot Area Air Monitoring System (DAAMS) as described in **Attachment F-2** of this permit modification.

The monitoring devices will be inspected as detailed in Section F-2 of this permit modification.

Operators will keep a log of events that occur during a work shift. These events include activities preceding, during, and following the treatment/destruction of munitions or items, any near real-time (NRT) monitoring alarms, and historical monitoring confirmations. The use of operating checklists and datasheets will enable operators to review historical analysis and records.

D-11d Compliance with RCRA Organic Air Emissions [6 CCR 1007-3 § 264 Subparts AA, BB, CC]

The strategy to comply with the RCRA organic air emissions is discussed in **Attachment D-3**.

D-11e Environmental Performance Standards for Miscellaneous Units [6 CCR 1007-3 § 264.601]

A miscellaneous unit must be located, designed, constructed, operated, maintained, and closed in a manner that ensures protection of human health and the environment. The EDS units have been designed and will be operated and closed in a manner that precludes the release of hazardous waste constituents as described in Sections D-11a(3) and (4) and D-11 b, c, and d; and in Sections F and I (closure) of this permit modification. Engineering and administrative controls in place during operations will preclude run-on, runoff, and contact with soil thus preventing surface and groundwater contamination as well as

releases to the atmosphere. Operations will occur inside an Environmental Enclosure within a vessel with secondary containment. Each Environmental Enclosure will have an attached AFS that consists of a prefilter, HEPA filter, two banks of sulfur-impregnated carbon filters and another HEPA filter along with fan and ductwork. Details on the AFS carbon filter performance are provided in **Attachment D-4**.

An environmental assessment (EA) titled *Proposed Installation and Operation of an Explosive Destruction Technology Facility at the Pueblo Chemical Depot, Pueblo, Colorado*, April 2012, discussed the construction and operation impacts of four types of explosive destruction technologies to human health and the environment at PCD; the EDS was one of the four technologies described. The assessment addressed impacts associated with land use, air quality, water resources, human health and safety, ecological resources, socioeconomic resources, environmental justice, noise, waste management, and resource consumption. The EA concluded with a recommendation for a finding of no significant impact that was published on August 13, 2012.

Lastly, a multi-pathway health risk assessment (MPHRA) report was completed in March 2012 titled *Multiple Pathway Health Risk Assessment Report for Explosive Destruction Technology Alternatives at the Pueblo Chemical Depot*. The EDS was included as one of the explosive destruction technologies evaluated. The results presented in the MPHRA report demonstrate that EDS emissions will produce exposures that are below all Colorado Department of Public Health and Environment (CDPHE) specified risk and hazard threshold values and accounting for quantifiable uncertainty parameters. The screening-level MPHRA employed very conservative assumptions and represents a reasonable worst-case estimate of potential impacts. A summary of the MPHRA results are as follows:

- A total of 24 COPCs was identified by the EDS vendor, published literature, or reaction kinetics models. Of the 24 COPCs, 10 have carcinogenic toxicity factors, 19 have chronic noncarcinogenic toxicity factors, and 23 have acute toxicity factors.

- The maximum lifetime cancer risk to any human receptor presented by the EDS is only 0.14% of the CDPHE acceptable risk level of 1 in a million (i.e., 1.0 E-06). When added to the risk calculated in 2008 for PCAPP operations, the maximum lifetime cancer risk is only 5.3% of the CDPHE acceptable risk level. The subsistence farmer represents the receptor with the greatest lifetime cancer risk for all four EDT options.

- For noncarcinogenic effects, the maximum combined Hazard Index (HI) to any human receptor presented by the EDS is only 0.32% of the CDPHE acceptable level of 0.25. When added to the HI calculated in 2008 for PCAPP operations, the maximum lifetime HI is only 2.8% of the CDPHE acceptable risk level. The subsistence farmer represents the receptor with the greatest lifetime noncancer hazard.

- The total acute HI (i.e., the hazards associated with short-term emission release events for each COPC that has both a quantified short-term emission rate and an available acute toxicity value) presented by the EDS is 37 times lower than the CDPHE acceptable level of 1.0. When combined with the PCAPP acute HI, the worstcase option is 17 times lower than the CDPHE acceptable level.

- An analysis was performed at organic and other farmlands in the vicinity of PCD to quantify the air concentrations and deposition rates as a percentage of the maximum calculated off-site impacts. This analysis demonstrated that the EDS produced an air concentration at the worst-case farmland receptor that was less than 1/4 of the concentration at the maximum impact location and a deposition rate that was only 1/34 of the deposition at the maximum impact location, indicating that impacts on nearby organic farmlands will be insignificant.

In summary, the EDS units will be operated to ensure compliance with the requirements of the Colorado hazardous waste regulations pertaining to miscellaneous units. No adverse impacts to human health or the environment are projected to be associated with release of waste constituents to the atmosphere from the Environmental Enclosures or from operations of the EDS units.

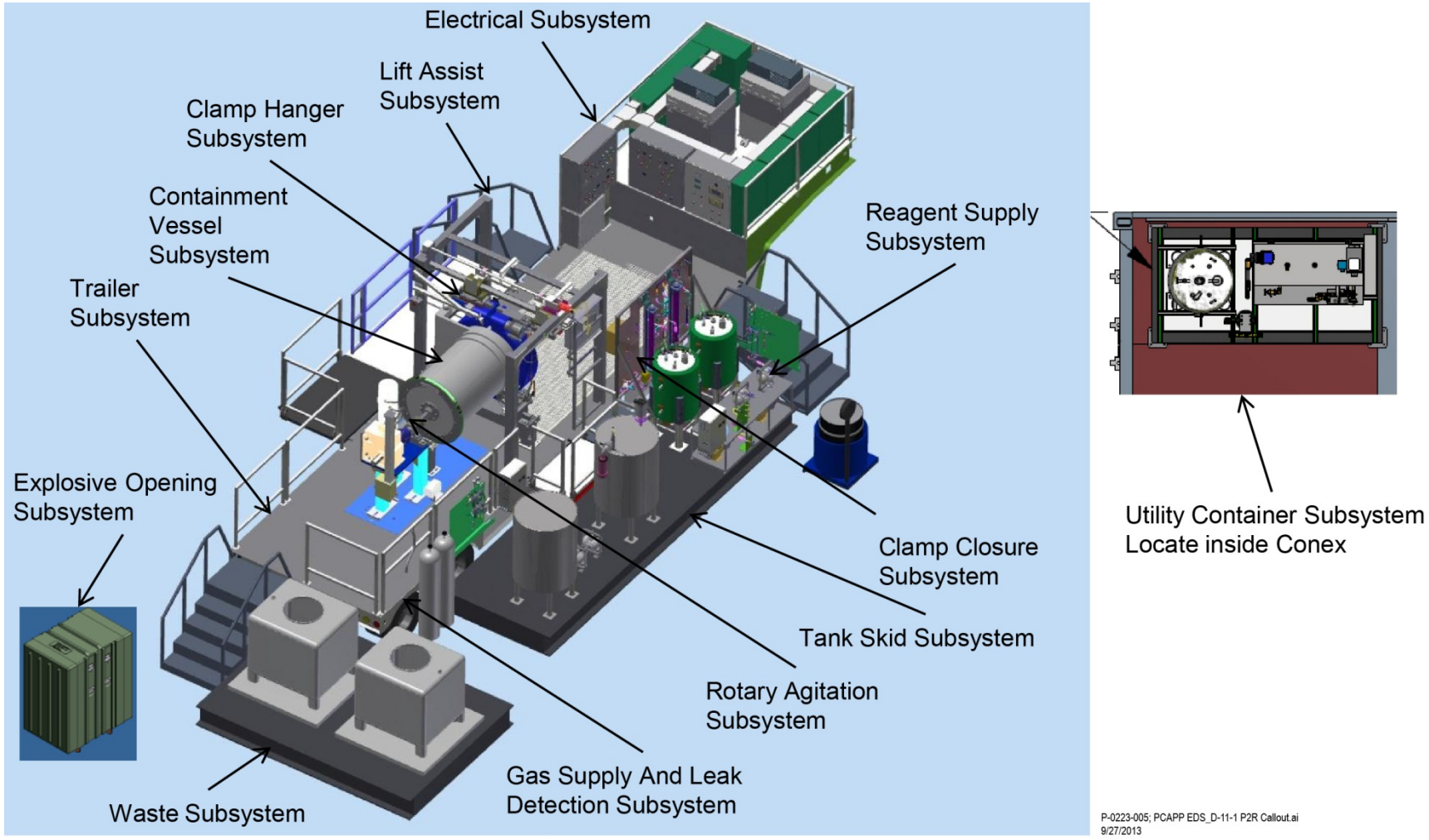

Figure D-11-1. Major Components of EDS P2R

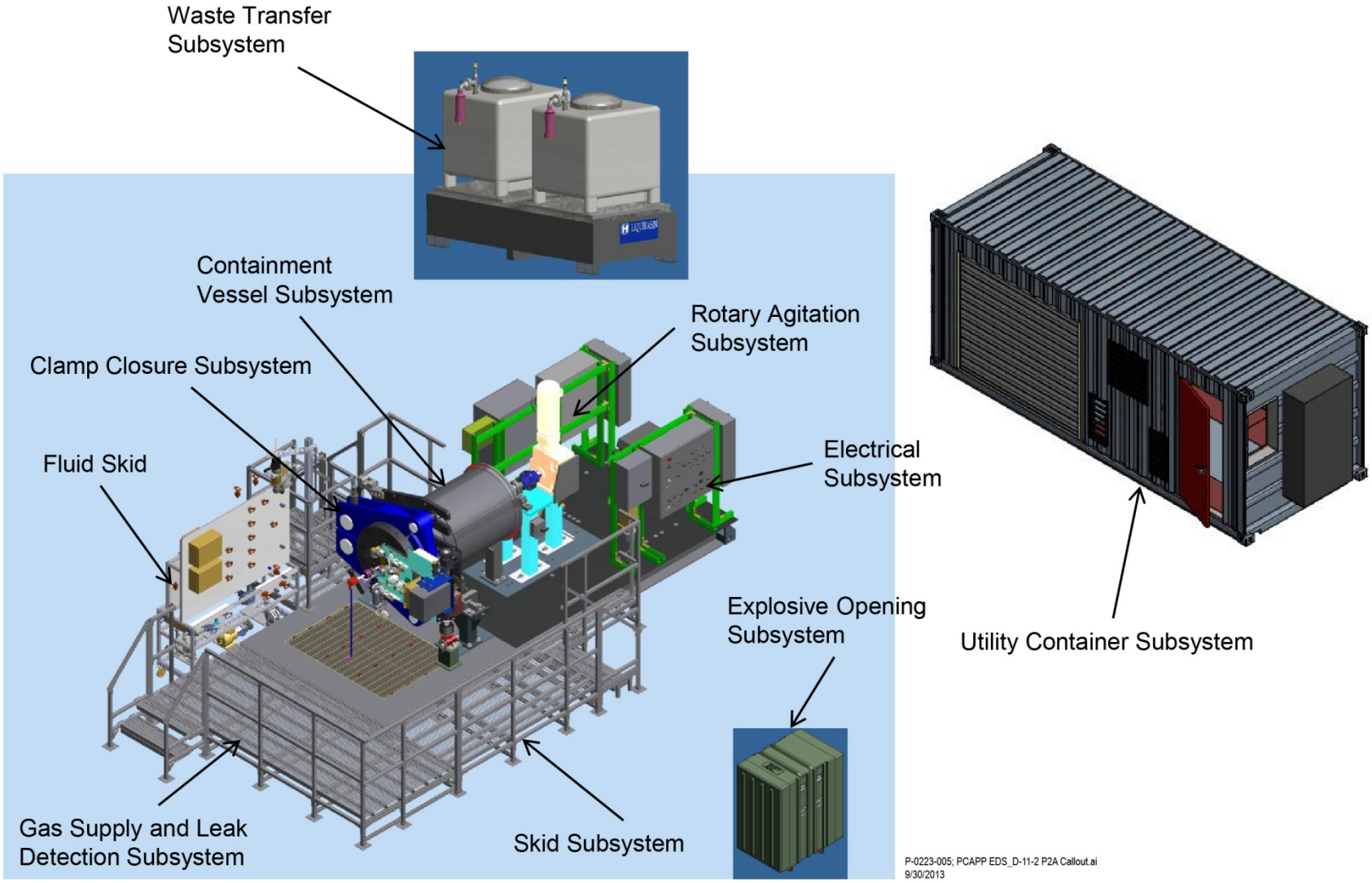

Figure D-11-2. Major Components of EDS P2A

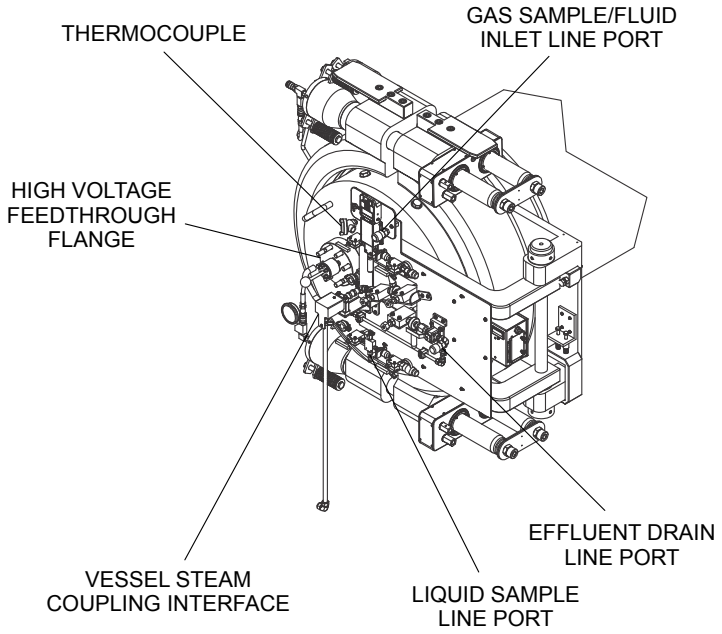

Figure D-11-3. EDS P2R Containment Vessel Door

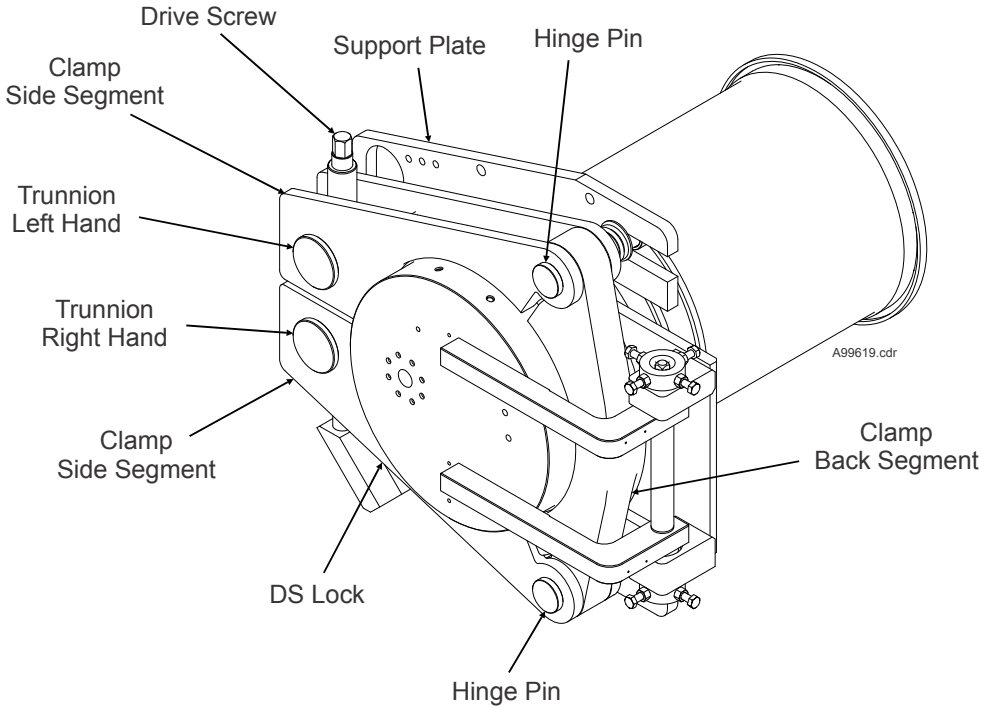

Figure D-11-4. EDS P2A Containment Vessel Door

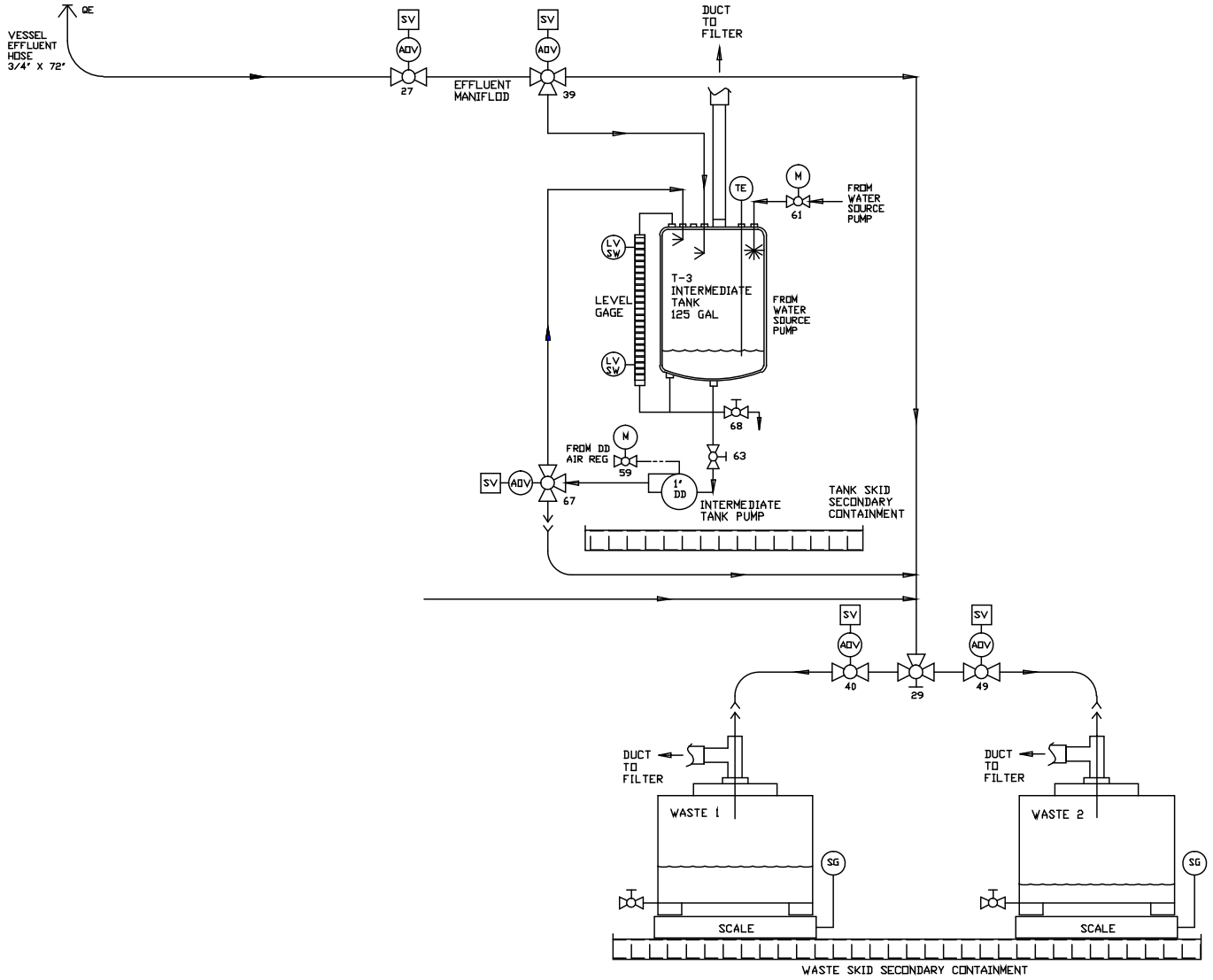

Figure D-11-5. Containment Vessel Waste Transfer

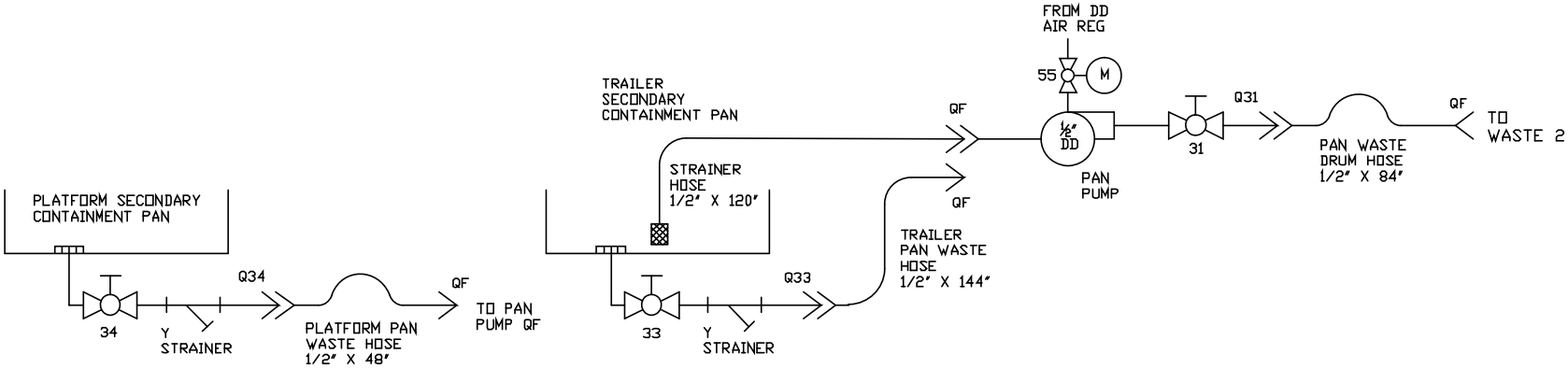

Figure D-11-6. Secondary Containment Pan Waste Transfer